

Principles of Agricultural Engineering

Principles of Agricultural Engineering includes standards on metal fabrication and agriculture structures. Subject matter will include hot/cold metal work, cost and material computation, electric wiring and codes, engine service and repair, blueprint reading and drawing and selection of appropriate materials for projects.

Pre-requisite: Any two courses in Agriculture Mechanics
Sub-cluster

Recommended Credit: 1 or 2

Recommended Grade Level: 11th and 12th

*** 1 denotes learning expectations that must be met when teaching the course for the 1st credit.**

**** All other learning expectations must be met when teaching the course for the 2nd credit.**

Principles of Agricultural Engineering

Standard 1.0

The student will demonstrate the correct operational procedures for advance metal fabrication and welding.

Standard 2.0

The student will evaluate the principles of electricity, including electric wiring, codes, equipment and motors.

Standard 3.0

The student will utilize the principles and techniques involved in the construction of agricultural structures.

Standard 4.0

The student will evaluate career options in the area of agricultural engineering.

Standard 5.0

The student will integrate core academic competencies in area of agricultural engineering.

Standard 6.0

The student will develop premier leadership and personal growth needed for career success and advancement in the area of agricultural engineering.

Course Description:

This course will include the basic technologies of metal fabrication and agriculture structures. Subject matter will include hot/cold metal work, cost and material computation, electric wiring and codes, blueprint reading and drawing and selection of appropriate materials for projects.

Standard 1.0

The student will demonstrate the correct operational procedures for advance metal fabrication and welding.

Learning Expectation

The student will:

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| 1.1 | Demonstrate the proper use of gas, arc, and shielded welding equipment. | 1 |
| 1.2 | Demonstrate the principles and techniques involved in blueprint reading and drawing. | 1 |
| 1.3 | Develop a bill of material and project costs. | 1 |
| 1.4 | Determine safe stress loads of materials. | 1 |
| 1.5 | Utilize principles of advance metal fabrication. | 1 |
| 1.6 | Use metal working tools and machines to complete projects. | 1 |
| 1.7 | Demonstrate approved safety practices in a shop/lab environment. | 1 |

Evidence Standard is Met:

The student will:

- Demonstrate the proper use of tools and equipment.
- Prepare to scale drawings and dimensional blue prints.
- Calculate the cost of materials and develop a list of materials needed from blueprints/drawings.
- Calculate stress loads of materials used in construction of advanced metal projects.
- Explain proper operation of and use of metal fabrication machines.
- Utilize industry safety practices to complete assignments in the shop/lab environment.

Integration/Linkages

Algebra, Science, SCANS (Secretary's Commission on Achieving Necessary Skills), Physics, Geometry, TOSHA Standards, OSHA Standards, CAD

Sample Performance Tasks

- Perform vertical butt and lap welds using gas arc and shielded arc welding.
- Design to scale drawings of a twelve-foot gate to scale using metal pipe.
- Fabricate a three-point hitch lift pole, using a blueprint.
- Fabricate a three-point hitch hay fork, using a blueprint.
- Determine project costs and bill of material for a three-point hitch lift pole.
- Determine stress loads for a three-point hitch lift pole.
- Prepare and sign safety agreement contract before working in the shop/lab environment.

Standard 2.0

The student will evaluate the principles of electricity, including electric wiring, codes, equipment and motors.

Learning Expectations:

The student will:

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| 2.1 | Explain the proper wiring of a circuit breaker panel. |
| 2.2 | Read and understand a house-wiring diagram. |
| 2.3 | Develop a bill of material and project costs for an electrical project. |
| 2.4 | Use electrical tools properly. |
| 2.5 | Use current electrical codes in all wiring applications. |
| 2.6 | Read and interpret blueprints, drawings, electrical codes and electrical diagrams. |

Evidence Standard is Met:

The student will:

- Demonstrate the proper wiring of a service entry panel.
- Demonstrate the ability to follow local electrical codes.
- Calculate a bill of material based on a house-wiring diagram.

- Recommend proper tools based on use and need.
- Estimate amount of electricity needed to operate various pieces of equipment at various distances from a source.
- Prepare procedures for wiring a small building in accordance with local codes.

Integration/Linkages

Mathematics, SCANS (Secretary's Commission on Achieving Necessary Skills), Physics, TOSHA Standards, OSHA Standards, Electronics, National Electrical and Wiring Codes

Sample Performance Tasks:

- Wire various electrical outlets and installations.
- Wire a service entry panel.
- Wire 220-branch and 110-branch circuits.
- Wire a 220 motor.
- Develop a list of materials and estimate the costs to wire a building.

Standard 3.0

The student will utilize the principles and techniques involved in the construction of agricultural structures.

Learning Expectations:

The student will:

- 3.1 Compare the advantages and disadvantages of different types of siding.
- 3.2 Compare the advantages and disadvantages of different types of roofing.
- 3.3 Determine the importance of stress loads of different materials.
- 3.4 Evaluate the use of different types of foundations.
- 3.5 Examine methods of finishing concrete.
- 3.6 Project costs of constructing agriculture buildings.

Evidence Standard is Met

The student will:

- Select the most economical type of siding to be used.
- Select the most economical type of roofing to be used.
- Calculate stress load of a building using specific materials.
- Demonstrate the ability to lay out a foundation correctly.
- Calculate cost of building materials and the amount needed.
- Demonstrate various methods of finishing concrete.

Integration/Linkages

Mathematics, Physics, Geometry, Algebra, SCANS (Secretary's Commission on Achieving Necessary Skills), Language Arts, OSHA Standards, TOSHA Standards

Sample Performance Tasks:

- Measure, mix, correctly pour and finish stepping-stones.
- Construct trusses based on load requirements.
- Plan, draw to scale and construct a doghouse.
- Develop a list of materials and cost of materials in constructing a pole barn.

Standard 4.0

The student will evaluate career options in the area of agricultural engineering.

Learning Expectations:

The student will:

- 4.1 Propose career goals related to agricultural engineering. **1**
- 4.2 Prepare a career plan for a related area in agricultural engineering. **1**
- 4.3 Utilize current resources to determine career opportunities in agricultural manufacturing and mechanics. **1**

Evidence Standard is Met:

The student will:

- Develop and maintain an accurate and neat portfolio.
- Complete a standard aptitude, career placement, or job profile test.

- Develop a four-year plan to obtain career goals.
- Create a presentation that examines career opportunities in agricultural mechanics and prescribes steps to be taken to obtain the career position.

Integration/Linkages

Language Arts, SCANS (Secretary's Commission on Achieving Necessary Skills)

Sample Performance Tasks

- Present a plan for career preparation.
- Present a portfolio on accomplishments and skills.
- Examine areas of the Work Keys test to determine strengths.
- Present a four-to-six-minute summary of a career interest area in agriculture engineering.

Standard 5.0

The student will integrate core academic competencies in area of agricultural engineering.

Mathematics:

The student will:

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| 5.1 | Use algebraic formulas to solve for materials needed in construction problems. | 1 |
| 5.2 | Solve arithmetical problems related to construction. | 1 |
| 5.3 | Solve speed, time, and distance problems. | 1 |
| 5.4 | Solve problems relating to volume, area, linear, and stress loads. | 1 |

Science:

The student will:

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| 5.5 | Explain the conversion of chemical energy to mechanical energy. | 1 |
| 5.6 | Explain the concept of metallurgy in relation to strengths and weaknesses. | 1 |
| 5.7 | Demonstrate the difference in strength of various concrete mixtures. | 1 |
| 5.8 | Describe the difference in strengths of various species of lumber. | 1 |

Evidence Standard is Met

The student will:

- Use data and charts to make appropriate decisions related to maintenance of agricultural equipment.
- Determine costs of agricultural mechanics and structure projects.
- Test and analyze engine systems.

Integration/Linkages

Algebra, Geometry, Physics, SCANS (Secretary's Commission on Achieving Necessary Skills), TOSHA Standards, OSHA Standards

Sample Performance Tasks

- Summarize technical details of working drawings, plans and blueprints.
- Determine the volume of concrete needed for project.
- Determine an algebraic formula used in finding the length of rafters.
- Test strength of welds by bending or applying stress loads.
- Calculate the stress or snow loads of different designs of trusses.

Standard 6.0

The student will develop premier leadership and personal growth needed for success and advancement in the area of agricultural engineering.

Learning Expectations:

The student will:

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|-----|--|----------|
| 6.1 | Demonstrate positive work attitudes and behaviors based on the FFA code of ethics. | 1 |
| 6.2 | Describe career plans that reflect permanent learning. | 1 |
| 6.3 | Demonstrate correct time management skills. | 1 |

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|-----|---|----------|
| 6.4 | Help others learn in order to achieve goals and expectations through an SAEP, supervised agricultural experience program. | 1 |
| 6.5 | Prepare to participate in FFA Agriculture Mechanics CDE. | 1 |

Evidence Standard is Met

The student will:

- Utilize the correct time management skills.
- Exhibit positive work attitudes and behaviors while working.
- Describe employment goals for the next three years.
- Describe how proper planning and organization can affect the outcome of a project.
- Present records for an SAEP.

Integration/Linkages

Language Arts, SCANS (Secretary's Commission on Achieving Necessary Skills), National FFA Guidelines for Agriculture Mechanics CDE, National FFA Guidelines for Proficiency Awards and Degrees, National FFA Guidelines for Community Education Programs

Sample Performance Tasks

- Hold a class discussion on attitudes and behaviors in the work place.
- Role-play situations where students assist each other to accomplish goals.
- Create a chart that lists correct management skills.
- Present a speech that describes a career plan in agricultural mechanics.
- Develop personnel goals for a five-year span.
- Teach a new skill related to agricultural engineering to another student.
- Complete application for FFA proficiency award.
- Complete applications for higher degrees in the FFA.
- Participate in FFA PALS program.
- Participate in Food for America Program.
- Participate in FFA Partners for a Safer Community.
- Participate in Farm Safety Just 4 Kids.
- Participate in America Reads Challenge.